

Remarks

In view of the above amendments and the following remarks, reconsideration of the outstanding office action is respectfully requested. Support for the above amendments to the claims is found on: page 5, lines 17-22; page 7, lines 12-18; page 13, lines 30-32; page 11, lines 10-13; page 20, lines 11-15; page 21, lines 21-25; page 22, lines 11-12; page 23, lines 13-15 and 18-22; and Figure 4.

The rejection of claims 25, 26, and 29 under 35 U.S.C. § 102 or 35 U.S.C. § 103 as anticipated by or for obviousness over U.S. Patent No. 6,361,996 to Rao, et. al., (“’996 patent”) is respectfully traversed.

The ’996 patent discloses multipotential neuroepithelial stem cells and lineage-restricted astrocyte/oligodendrocyte precursor cells (the ’996 patent Abstract). The astrocyte/oligodendrocyte precursor cells are derived from neuroepithelial stem cells, are capable of self-renewal, and can differentiate into astrocytes and oligodendrocytes but not neurons (*Id.*). Figure 1 of the ’996 patent and the supporting text of the specification refer to cell type 14 as a multipotential precursor cell that can generate oligodendrocytes 18 and astrocytes 22. Cell type 14 is said to be generated from embryonic spinal cord stem cells. Figure 2 of the ’996 patent depicts multipotential neuroepithelial stem cells 50 which differentiate into oligodendrocyte-astrocyte progenitor cells 54 that are capable of self-renewal as well further differentiating into oligodendrocytes 58, type 1 astrocytes 62, and type 2 astrocytes 66 (col. 17, lines 4-9). The ’996 patent characterizes these cells as “multipotential intermediate precursor cells restricted to glial lineages” (emphasis added) (the ’996 patent col. 23, lines 1-5). Examples 14 and 15 of the ’996 patent demonstrate that the astrocyte/oligodendrocyte precursor cells have strong bias to differentiate to astrocytes. In particular, Example 14, at col. 20, lines 44-60 states:

After 5 days of culturing, NEP cells in the absence of CEE, cells were immunopurified, plated on fibronectin/laminin coated dishes, and exposed to cytokines previously associated with differentiation of precursor into oligodendrocytes, astrocytes, or neurons. The A2B5-panned population was >98% positive of A2B5⁺ cells when stained one hour after panning. Staining 24 hours after plating showed that all cells of the panned population were A2B5⁺ and did not express any other lineage markers tested.

Panned cultures in the presence of bFGF and no other growth factors for 5 days consisted of 1% oligodendrocytes, 50% GFAP⁺ astrocytes, and 49% A2B5⁺ cells. The proportion of differentiated cells was significantly shifted when the bFGF-containing medium was replaced after 3 days with medium supplemented only with PDGF. Under these conditions, the culture consisted of 30% oligodendrocytes, 50% astrocytes, and 20% A2B5⁺ cells.

Similarly, Example 15 of the '996 patent (col. 21, line 59 to col. 22, line 11) states that as a result of culturing in CNTF and bFGF, the A2B5⁺ cells predominantly differentiate into cells with a type-2 astrocyte phenotype. This is entirely consistent with the previously submitted Second Declaration of Mahendra S. Rao, M.D., Ph.D. Under 37 C.F.R. § 1.132 ("Second Rao Declaration"). Gregori et al., "The Tripotential Glial-Restricted Precursor (GRP) Cell and Glial Development In the Spinal Cord: Generation of Bipotential Oligodendrocyte-Type-2 Astrocyte Progenitor Cells and Dorsal-Ventral Differences In GRP Cell Function," *J. Neurosci.* 22(1):248-256 (2002) has suggested that the '996 patent describes a glial progenitor that gives rise to a more restricted astrocyte/oligodendrocyte precursor that still directly makes predominantly astrocytes and a small minority of oligodendrocytes (Second Rao Declaration ¶ 7). Thus, cells in the '996 patent's pathway to oligodendrocyte production are bi-potential astrocyte/oligodendrocyte progenitor cells that have strong astrocytic bias (*Id.*). This bias of the '996 patent's astrocyte/oligodendrocyte progenitor to differentiate to astrocytes clearly distinguishes them from the presently claimed oligodendrocyte progenitor cells, the majority of which mature into oligodendrocytes.

It is important to note that multiple pathways to generate post-mitotic, mature oligodendrocytes, have been described (*Id.*). Anderson and colleagues have shown that an oligodendrocyte/motorneuron precursor exists that does not make astrocytes (Zhou et al., "The bHLH Transcription Factors OLIG2 and OLIG1 Couple Neuronal and Glial Subtype Specification," *Cell* 109:61-73 (2002)(*Id.*). Other investigators have shown distinct sites of origin of oligodendrocytes and astrocytes presumably from separate precursors (Vallstedt et al., "Multiple Dorsoventral Origins of Oligodendrocyte Generation In the Spinal Cord and Hindbrain," *Neuron* 45:55-67 (2005) and Cai et al., "Generation of Oligodendrocyte Precursor Cells from Mouse Dorsal Spinal Cord Independent of *Nkx6* Regulation and *Shh* Signaling," *Neuron* 45:41-53 (2005)(*Id.*). Yet other investigators have shown that different kinds of oligodendrocyte progenitors exist (Pringle et al., "*Fgfr3* Expression by Astrocytes

and Their Precursors: Evidence that Astrocytes and Oligodendrocytes Originate In Distinct Neuroepithelial Domains,” *Development* 130:93-102 (2003)(*Id.*). Since the state of the art suggests that different oligodendrocyte-astrocyte cell profiles exist in different circumstances, there is no reason to believe, as the U.S. Patent and Trademark Office (PTO”), has suggested, that the ‘996 patent inherently produces another precursor which has the claimed characteristics.

The Examiner’s Answer states that the claims are anticipated by Examples 7 and 15 of the ‘996 patent. According to the PTO, these examples must produce an intermediate between the ‘996 patent’s oligodendrocyte-astrocyte precursor cells and fully differentiated cells. The PTO particularly relies on Example 7’s mention of cells that appeared to have a different morphology than the oligodendrocyte type-2 astrocyte progenitors or mature oligodendrocytes in asserting anticipation. We disagree. Firstly, these examples involve work with rat cells – not human cells. Moreover, the mention of cells having a morphology that is different than the oligodendrocyte type-2 astrocyte progenitors or mature oligodendrocytes does not mean that those additional cells are the claimed oligodendrocyte progenitor cells. The PTO’s point is entirely speculative and is contrary to what Dr. Rao said in his second declaration. In taking this position, the Examiner’s Answer is impermissibly ignoring the testimony of Dr. Rao who is in a far better position to know what cell types his work made and did not make.

Applicants maintain that claim 26 is patentable of its own accord, because the claimed adult human oligodendrocyte progenitor cells are distinguishable from the ‘996 patent’s glial progenitor cells from newborn rat brain. The PTO’s suggestion that this difference in age is not a proper basis for distinguishing the claimed invention is unsupported and completely incorrect. Those skilled in the art would readily recognize that the difference in lineage between the ‘996 patent’s rat cells and the adult human cells of claim 26 constitutes a clear distinction in the cells’ stage of development. In view of this significant difference, the ‘996 patent cannot be said to teach or suggest the cells of claim 26.

In view of all of the foregoing, applicants submit that this case is in condition for allowance and such allowance is earnestly solicited.

Respectfully submitted,

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